

# UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602111N

PROGRAM ELEMENT TITLE: Air and Surface Launched Weapons Technology

COST: (Dollars in Thousands)

PROJECT NUMBER & TITLE	FY 1999 ESTIMATE	FY 2000 ESTIMATE	FY 2001 ESTIMATE	FY 2002 ESTIMATE	FY 2003 ESTIMATE	FY 2004 ESTIMATE	FY 2005 ESTIMATE	TO COMPLET E	TOTAL PROGRAM
Air & Surface Launched Weapons Technology	37,624	51,331	37,966	38,706	37,297	36,568	36,194	CONT.	CONT.

A. (U) MISSION DESCRIPTION AND BUDGET ITEM JUSTIFICATION: This program element (P.E.) develops new and innovative technologies which will support future weapons systems for surface and air platforms for Naval Warfare.

(U) The Air and Surface Weapons Technology (ASWT) program has been developed to implement a structured weapons technology program that will maintain the Naval air and surface weapons capability through the 21 century. The ASWT program provides technology traceability by identifying System payoffs and warfighter benefits and the quantitative goals that will provide those payoffs/benefits. Objectives, technical challenges, and approaches that will meet the goals are then identified for each of the four mission areas. The following paragraphs describe the time phased technology goals for each of the four mission areas.

(U) Air Superiority: The projects within the ASWT Air Superiority mission area are focused on the achievement of time-phased technology goals for the 2005, 2010, and 2015 time frame, which will reproduce a number of technology options for future air superiority weapons, significantly increase pilot survivability by allowing them to look first, shoot first, and kill first, while increasing air superiority weapon affordability. The 2005, 2010, and 2015 technology goals, which have been coordinated with N88, are to increase missile flyout range 25%, 50%, and 100%; increase missile average

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velocity 10%, 20%, and 30%; increase missile maneuverability 45%, 65%, and 85%; increase weapon launch angle 20%, 40%, and 60%; increase missile seeker acquisition range 100%, 250%, and 300%; increase seeker off boresight angle 135 degrees and 180 degrees; increase seeker probability of detect 10%, 20%, and 30%; decrease missile payload size 20%, 30% and 50%; and increase warhead control accuracy to centroid, image centroid, and edge detect. All improvements are relative to the AIM-9x and AIM-120C system. Work being performed under the Integrated High Payoff Rocket Propulsion Technology (IHRPT) is supporting the achievement of the flyout range, average velocity, maneuverability, and weapon launch angle goals. As with the IHRPT program, the ASWT program is an integrated Navy/industry program, comprised of government funded and industry funded projects. For FY 99 through FY04, the emphasis will be on the achievement of the Phase 1 goals. The technologies developed under this task will be transitioned to the Phase 1 air superiority demonstrator, which is funded under P.E. 0603217N, R0447. After successful demonstration, these technologies are available for air superiority or ship-based defense weapon system demonstration/validation or Engineering and Manufacturing Development (EMD).

(U) Naval Fire Support: The projects within the ASWT Naval Fire Support mission area are focused on the achievement of time-phased technology goals for the 2005, 2010, and 2015 time frame. The achievement of these goals will produce a number of technology options for future naval fire support weaponry, significantly improving the probability of kill per round as well as the amount of sustained call fire while increasing the affordability of future naval fire weapon systems. The 2005, 2010, and 2015 goals, which have been coordinated with N86, are increase gun launched projectile flyout range to 70 nmi, 150 nmi, and 200 nmi; increased missile flyout range to 150 nmi, 250 nmi, and 350 nmi; achieve gun projectile flyout times for the range goals of 6 minutes or less, 14 minutes or less, and 10 minutes or less; achieve missile flyout times for the range goals of 5 minutes, 4 minutes, and 4 minutes; increase target aimpoint accuracy to 10m, 1m, and 1m for moving targets; increase payload density to 15%, 30%, and 45%; decrease rounds per kill to 3, 1.2(stationary target), and 1.2 (hard target); and develop improved warheads that can: deliver a variety of submunitions, operate in a dual or multifunction mode and, utilize high energy reactive materials for greater effectiveness. All these goals are relative to 1995 state-of-the-art. The projectile range and time of flight goals are being supported in part by the IHRPT program. The emphasis of the FY99-FY04 program will be on the achievement of the Phase 1 (2005) goals. Technologies developed to support this phase will be transitioned to the phase 1 Land Attack

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demonstrator, funded by P.E. 0603217N, R0447. Upon successful demonstration, these technologies are available for Naval Fire Support or Land Attack weapon system demonstration/validation or EMD. As with the IHP RPT program, the ASWT program in an integrated Navy/industry program with tasks being funded and performed by government and industry.

(U) Precision Strike: The ASWT Precision Strike program is focused on the achievement of time-phased technology goals for the 2005, 2010, and 2015 time frame. The achievement of these goals will produce technology options to allow the warfighter to successfully engage time critical targets, improve weapon and platform survivability, significantly increase weapon hard target capability, and significantly increase single shot probability of kill while increasing the affordability of future precision strike weapon systems. The 2005, 2010, and 2015 goals, which have been coordinated with N88, are to decrease target location error to 8m, 1m, and 1m; increase target/weapon pairing rate to 20/hr, 100/hr, and 500/hr; decrease mission planning and optimization time to less than 5 minutes, then to less than 1 minute; increase weapon based Automatic Target Recognition (ATR) capability to greater than 90% acquisition in limited clutter, greater than 90% acquisition in moderate clutter, and greater than 60% acquisition in heavy clutter; increase average weapon velocity to M4, M6, and M8; increase weapon flyout range 30%, 50%, and 100%; increase hard target penetration by 5x and 7x; and increase seeker Global Positioning System (GPS) antijam capability to +10db, +20db, and +30db. All goals are relative to 1995 state of the art. The weapon velocity and range goals are partially supported by the projects within the IHP RPT program. The emphasis of the FY99-FY04 projects are to achieve the Phase 1 goals. The technologies developed by the funded projects will be transitioned to the Land Attack demonstrator, funded by P.E. 0603217N, R0447. Upon successful demonstration, these technologies will be available for Precision Strike or Land Attack weapon system demonstration/validation or EMD. As with IHP RPT, the ASWT program is an integrated Navy/industry program with work being funded and performed by the government and industry.

(U) Ship Based Defense: The ASWT Ship-Based Defense program is focused on the achievement of time-phased technology goals for the 2005, 2010, and 2015 time frame. The achievement of these goals will produce technology options to significantly increase the effectiveness and affordability of future ship-based defense weapon systems. The 2005, 2010, 2015 goals, which have been coordinated with N86, are to increase the number of engagements per threat to 2-3, 6-7, and 6-7; increase

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the available command decision time to 15 sec, and 15 seconds in adverse conditions; increase the probability of catastrophic kill per intercept to 0.6, 0.8, and 0.95; increase the total number of targets simultaneously engagable to 2-4, 4-6, and 6-8; and increase maneuver counter capability to 15gs, 30gs, and 50gs. All goals are relative to 1995 state of the art. The emphasis of the FY99-FY04 projects are on the Phase 1 goals. The technologies developed to achieve these goals will be transitioned to a ship-based defense technology demonstrator, funded by P.E. 0603127N, R0447. Upon successful demonstration, these technologies will be available for Ship-Based Defense or Air Superiority demonstration/validation or EMD. The ASWT program is an integrated Navy/industry program with projects being funded and performed by government and industry.

(U) Integrated High Payoff Rocket Propulsion Technology (IHRPRT): The projects within the IHRPRT program are focused on the achievement of time-phased technology goals for the 2000, 2005, and 2010 time frame, which will produce a number of rocket propulsion technology options to significantly increase the effectiveness of air superiority, naval fire support, and precision strike weapon systems by increasing missile range 50%; increasing missile speed 20%, which results in shorter time to target, increased opportunity for shoot-look-shoot, allowing earlier disengagement of launch platforms, and allowing greater energy for maneuvering; increasing missile payload by 100%, decreasing propulsion size and weight by 25%, and doubling the missile no-escape zone and launch acceptability regions. The 2000, 2005, and 2010 goals, which have been coordinated with N86 and N88, and endorsed by Deputy Director Research and Engineering (DDR&E), are to improve the propulsion system delivered energy by 3%, 7% and 15%; improving motor mass fraction (without thrust vector control (TVC)/throttling) 2%, 5%, 10%; and improving motor mass fraction (with TVC/throttling) 10%, 20%, and 30%. IHRPRT is an integrated Department of Defense (DoD)/National Aeronautics and Space Administration (NASA)/Industry program with projects being funded and performed by government and industry.

(U) Due to the sheer volume of efforts involved in this P.E., the efforts described in the accomplishments and plans section are representative selections of the work included in this P.E..

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(U) These efforts support the Joint Warfare Strategy "Forward...from the Sea". Programs in this P.E. are jointly planned in the Defense Reliance process with the Air Force and Army.

(U) JUSTIFICATION FOR BUDGET ACTIVITY: This program is budgeted within the APPLIED RESEARCH Budget Activity because it investigates technological advances with possible applications toward solution of specific naval problems, short of a major development effort.

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## PROGRAM ACCOMPLISHMENTS AND PLANS:

### 1. FY 1999 ACCOMPLISHMENTS:

- (U) SHIP BASED DEFENSE IN SUPPORT OF SURFACE BATTLESPACE: The efforts in Ship Based Defense will develop weapons technologies to achieve minimum and maximum intercept ranges of 100 meters to 3 nmi, to reduce reaction time to 10 seconds, and to increase the probability of robust kills from 0.3 to 0.6.
  - (U) Demonstrated the terminal accuracy of a 60mm projectile attainable with low cost strapdown W-band seeker in a track-via-projectile mode.
  - (U) Conducted preliminary concept design studies for Ram Accelerator high-pressure gas management. Performed computational fluid dynamic modeling of in-bore high-pressure combustion processes. Provided documentation of results of experimental and computational high-pressure investigations.
- (U) AIR SUPERIORITY:  
Demonstrated Radio Frequency (RF) Guidance Integrated Fuse (GIF) algorithms to provide real time estimates of warhead firing commands under a range of high-speed air-to-air encounters.
  - (U) Quantified technology objectives and parameter matrix for clutter rejection in Infrared (IR) terminal seeker performance task.
  - (U) Investigated aimable ordnance to increase missile lethality equal to or less than 80% of the current weight/volume of Advance Medium Range Air to Air Missile (AMRAAM) warhead.
- (U) Integrated High Payoff Rocket Propulsion Technology (IHPRPT):
  - (U) Tested materials for low-erosion nozzle task complete. The results will be analyzed and documented.
  - (U) Fabricated candidate nozzles for a Phase I improved delivered energy and improved mass fraction goals.

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- (U) Validated slow cook-off engineering model. Completed slow cook-off technology task.
  - (U) STRIKE AND Anti Surface Warfare (ASUW) WEAPONRY:
    - (U) Demonstrated portable Laser Radar (Ladar) performance model to identify optimum performance against mobile targets.
    - (U) Developed automatic target acquisition algorithms for standoff weapon seekers utilizing linear fracture correlation techniques.
  - (U) Naval Fire Support (NFS):
    - (U) Performed Image Video Analysis for near real time integrated detection, tracking, and location of targets with image. Completed fabrication of demo hardware and began software modifications for rehost on the weapon host computer.
    - (U) Developed Hyperspectral decoy recognition technologies for use by air platforms such as Unmanned Air Vehicle (UAVs). Performed field measurements against decoys and targets from aircraft.
    - (U) Investigated Inteferometric Synthetic aperture Radar (IFSAR) technologies to reduce the cost per kill through improved aimpoint accuracy and supporting mission planning and Bomb Damage Analysis (BDA). Test using L-band and X-band IFSAR in aircraft.
3. FY 2000 Plan:
- (U) SHIP BASED DEFENSE IN SUPPORT OF SURFACE BATTLESPACE:
    - (U) Initiate:
      - (U) Weaponization assessment for variable lethality weapon systems for ship defense to address asymmetrical threats.

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- (U) Investigation of technologies designed to reduce command decision time in littoral environments.
- (U) Continue:
  - (U) Lethality assessment for solid state High Energy Laser (HEL) self defense-investigate aerokill and critical component kill.
  - (U) Conformal seeker technology development. Complete design of conformal seeker breadboard.
  - (U) Low altitude Target Detection Device (TDD) technology development. Perform critical technology definition of laser, high bandwidth receiver and electronics, optics and detectors.
  - (U) Integration of the digital receiver, aperture, and processor for the Wideband Seeker.
- (U) Complete:
  - (U) Evaluation and testing of IR clutter suppression techniques. Documentation of results. Potential transitions to Thermal Imagery Sensor System (TISS), or MK56 Electro Optic sight, SM-2, Blk IV B.
  - (U) Evaluation of low altitude propagation sensing techniques applied to sensor real-time adaptation. Incorporate into P.E. 0603217N technology demonstration.
  - (U) Surface launched, high-speed propulsion investigations
- (U) AIR SUPERIORITY:
  - (U) Initiate:
    - (U) Air platform internal carriage environment weapon sensitivity study.
    - (U) Systems investigation of medium to long range target acquisition and track capabilities in conjunction with projected missile kinematic improvements.
    - (U) Investigation of technical issues relating to cooperative engagement/network centric warfare.
    - (U) Investigation of the feasibility of the variable warhead output (beam spray and frag size). Identification of the missile integration requirements to implement roll to aim.
  - (U) Continue:

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- (U) Seeker counter-counter measure (CCM) technology and IR seeker performance algorithm development based on wavelet transforms.
- (U) Precision intercept task that evaluates functional allocation of lethality factors among the warhead fragments, timing, and missile kinematic subsystems.
- (U) Development of functioning transmitter/receiver hardware for the Surface Wave Antenna Guidance (SWAG) based seeker.
- (U) Analysis of the use of advanced weapons against a specific set of enemy air targets.
- (U) Development of range and range rate target state algorithms for the Precision Intercept technology.
- (U) Complete:
  - (U) Investigation of aimable ordnance to increase missile lethality equal to or less than 80% of the current weight/volume of AMRAAM warhead. Prioritize recommendations among the fireset, reactive materials and explosive kills provided.
  - (U) Laboratory demonstrations of laser counter measure (CM) technique.
- (U) IHRPRT:
  - (U) Initiate:
    - (U) Propellant formulation tasks to identify and evaluate propellant ingredients to meet Phase III IHRPRT delivered energy and mass fraction goals.
    - (U) Surface launched propulsion task to develop innovation case, insulation, and liner technologies to meet Phase II IHRPRT mass fraction goals.
  - (U) Continue:
    - (U) Conduct full-scale, "hot" testing of on-command pintle Thrust Vector Control (TVC) components.
  - (U) Complete:
    - (U) Complete "hot" testing of full-scale dual movable nozzle, demonstrating Phase I IHRPRT mass fraction goals.

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- (U) Complete ballistic and mechanical evaluation testing on dual plateau propellants, achieving Phase I delivered energy and mass fraction goals
- (U) Conduct full scale firing of gun-launch rocket, using "optimal" grain and case design, which completes the gun-launched rocket task by demonstrating Phase II IHPRT goals
- (U) Complete ballistic characterization testing of aluminum hydride propellants, showing possible achievement of Phase II IHPRT delivered energy goal.
- (U) Complete ballistic characterization testing of ammonium dinitramide (ADN) propellants, showing possible achievement of Phase II IHPRT delivered energy goal.
- (U) STRIKE AND ASUW WEAPONRY:
  - (U) Initiate:
    - (U) Precision auto weaponizing task that generates a desired meanpoint of impact (DMPI) in support of the achievement of Air and Surface Weapons Technology (ASWT) fire control accuracy goal of <3m Circular Error Probability (CEP), meeting Phase I ASWT goals.
    - (U) Develop investment strategy for autonomous system weapon control capability.
  - (U) Continue:
    - (U) Tuned Automatic Target Recognition (ATR) extraction and registered data base
    - (U) Fuzzy ATR characterization to develop seeker (ATR) algorithms.
    - (U) Assessment of low cost seeker components in the millimeter wave (MMW) spectral region.
    - (U) Counterflow thrust vectoring control (TVC) task to increase mass fraction performance.
    - (U) ATR performance prediction task for imaging seeker-based ATR systems.
    - (U) Development of a low cost MMW antenna element using micro electronic machine systems (MEMS) technology using MMW radar.
    - (U) Investigation of advanced wavelet-based signal processing techniques to reject global positioning system (GPS) jammers.

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- (U) Investigation into the design of an autonomous attack and weaponeering capability for Uninhabited Combat Air Vehicles (UCAV)
- (U) Investigation and development of autonomous mission planning package for UCAV applications. Mission planning capability to include path planning, obstacle avoidance, and resource allocation.
- (U) Precision Target Handoff and Advanced Data Assimilation for precision targeting tasks. These tasks are developing technology tasks to support the ASWT goals of 10m fire control accuracy and a 20/hr target/weapon pairing rate.
- (U) Configurable ATR system and ATR performance prediction tasks supporting the weapons based ATR and Rapid planning ASWT goals.
- (U) GPS Anti-jam and MEMS aperture tasks addressing the robust CEP and target detection goals.
- (U) Develop airframe and modular data link and seeker components for affordable weapon project.
- (U) Complete:
  - (U) Demonstration of Suppression of Energy Air Defenses (SEAD) fuze discrimination techniques for masted targets clutter.
  - (U) Evaluation of laser radar image processing algorithms based on fuzzy logic and variational principal processing techniques supporting ATR of relocatable targets.
  - (U) Assessment of supersonic lifting body airframe technology with emphasis on high-speed propulsion/airframe integration issues.
- (U) NFS:
  - (U) Initiate:
    - (U) Marine Corps responsive volume fire weapon system study.
    - (U) Development of tunable explosives for controlled lethality effects.
  - (U) Continue:
    - (U) Investigation of weapon control and target sensing techniques comparable with mission responsive ordnance concept. Complete direct capability analysis in selected weapons.

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- (U) Finalize algorithm and packaging design of seeker for the Electro Optic/Infrared (EO/IR) gun launched seeker to improve terminal guidance of projectiles.
- (U) Weapons modeling and simulation to provide tools for design of NFS systems include Computational Fluid Dynamics (CFD) for vertical launchers and aero-prediction codes.
- (U) Complete missile warhead feasibility analysis for the Mission Responsive Ordnance (MRO) technology task. Continue MRO effort to improve warhead capabilities.
- (U) Investigate Image Video Analysis for near real time integrated ability to detect, track, classify, and precisely locate targets with image and video to increase targeting accuracy and provide a reduced response time for targeting.
- (U) IFSAR to demonstrate and validate techniques for processing multi-path IFSAR into Digital Elevation Maps (DEMS) with techniques to control DEMS to GPS. These efforts will attempt to reduce the cost per kill through improved aimpoint accuracy as well as supporting mission planning and BDA. Evaluate optical computing for real time performance.
- (U) Precision targeting with GPS/Inertial Measurement Unit (IMU) for precise attitude. Demonstrate sub-milliradian attitude measurement accuracy.
- (U) Complete:
  - (U) Hyperspectral seeker tasks supporting target detection and location by air platforms.

## 4. FY 2001 Plan:

- (U) SHIP BASED DEFENSE IN SUPPORT OF SURFACE BATTLESPACE:
  - (U) Initiate:
    - (U) Preliminary investigation into solid state laser technology ship self defense weapons.
  - (U) Continue:
    - (U) Variable lethality weapon technology assessment against asymmetric threats. Preliminary design of lethality engineering model.

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- (U) Development of decision aid and sensor technologies designed to increase the time available to the commander to evaluate and make the decisions necessary to engage the threat in littoral environments.
- (U) Complete:
  - (U) Conformal seeker technology development through breadboard demonstration.
  - (U) Development of the demonstration system for the Miniature TDD.
- (U) AIR SUPERIORITY:
  - (U) Initiate:
    - (U) Development of multi-spectral sensor fusion GIF algorithms to control the trajectory and output for precision intercept control.
    - (U) Comparative analysis of nanoaluminum for use as a high energy density explosive. Selection of fuel oxidizer combinations and associated reactivity.
  - (U) Continue:
    - (U) Propulsion airframe guidance and control and ordnance tasks to achieve the ASWT air superiority phase I goals.
    - (U) Precision intercept task that will be demonstrated by FY05 to decrease payload size by 20%. Document via simulation the missile dynamics required to align aimed ordnance kill axis to target aimpoint.
    - (U) Seeker CCM technology task. Prioritize recommendations for feasibility demonstrations of IR seeker rejection of spectrally tuned decoy technology.
    - (U) Variable warhead output tests for the integrated aimed warhead. Optimize best techniques for variable warhead maximum output.
  - (U) Complete:
    - (U) IR seeker performance assessment of multidimensional filter and moving target indication cueing for effectiveness of point target acquisition in the presence of ground clutter.

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- (U) IHRPT:
  - (U) Initiate:
    - (U) High-performance tactical propellant development task, which will conduct ballistic, mechanical property, and processing evaluation of the promising Phase II propellant task which were completed in FY00.
    - (U) Initiate Phase III propellant ingredient formulation task to identify promising propellant ingredients to meet IHRPT Phase III delivered energy goal.
    - (U) Initiate case insulation and high temperature resin technology task, which will identify and characterize these subsystems, contributing to the achievement of Phase II and Phase III IHRPT mass fraction and delivered energy goals.
    - (U) Initiate advanced tactical nozzle technology task, which will characterize materials and develop optimal design methodologies, contributing to the achievement of Phase II and Phase III IHRPT mass fraction and delivered energy goals.
  - (U) Continue:
    - (U) Development of test matrix and conduct initial ballistic screening testing of possible Phase III IHRPT propellant ingredients.
    - (U) Subscale case and insulation testing and begin design methodology characterization for surface launched propulsion task.
  - (U) Complete:
    - (U) Full scale "hot" testing of on-command pintle nozzle concept, completing this task. This will contribute to the achievement of the Phase II improved mass fraction goal.
- (U) STRIKE AND ASUW WEAPONRY:
  - (U) Initiate:

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- (U) Development of ATR and fire control techniques for UCAV "single pass, multiple target engagement.
- (U) Continue:
  - (U) Precision target handoff and precision auto-weaponeering tasks
  - (U) Configurable ATR system investigation to assess performance and predictability of ATR systems.
  - (U) Investigation of supervised and automated UCAV weapon control and both adaptive and cooperative swarm techniques.
- (U) Complete:
  - (U) Advanced Data Assimilation for Precision Targeting task. This task supports the strike fire control and target/weapon pairing rate goals.
  - (U) ATR performance prediction task.
  - (U) GPS anti-jam and MEMS aperture tasks.
  - (U) Supersonic lifting body airframe effort.
- (U) NFS:
  - (U) Initiate:
    - (U) Reactive warhead, barrage projectile, target deconfliction, urban precision targeting, High Energy Density Materials (HEDM) weaponization,
  - (U) Continue:
    - (U) NFS tunable explosive formulation and development
    - (U) Surface target lethality assessment.
    - (U) Complete joint testing with Direct Attack Munition Affordable Seeker (DAMASK) and evaluation of template and algorithms for the ongoing EO/IR gun launched seeker effort.
    - (U) Weapons modeling and simulation to provide tools for design of NFS systems include CFD for vertical launchers and aeroprediction codes.

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- (U) Finish Controlled Reference Image Base (CRIB) development from aircraft measurements and comparison to ground truth for Image Video Analysis task. Continue other Video Analysis efforts to provide real time target detection location and tracking for fire support missions.
- (U) Develop the technology for processing multipath IFSAR into DEMS and the techniques to accurately align DEMS and GPS.
- (U) Precision targeting with GPS/IMU. Demonstrate 100  $\mu$ radian attitude error using Kalman filter GPS, IMU, and kinematic alignment algorithms.
- (U) Complete:
  - (U) Mission responsive warhead technology development for gun-launched projectiles. Technology ready for transition to ASWT 6.3 Land Attack Demonstration.

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## B. (U) PROGRAM CHANGE SUMMARY

	<u>FY 1999</u>	<u>FY 2000</u>	<u>FY 2001</u>
FY 2000 President's Budget:	40,823	37,616	39,572
Appropriated Value:	-	51,616	-
Adjustments from FY 2000 PRESBUDG			
SBIR/STTR Transfer:	-423	0	0
Execution Adjustment	-2,560	0	0
Federal Tech Transfer Adjustment	-32	0	0
Inflation Rate Adjustment	-186	0	0
Program Adjustments	0	0	-1,649
Mil/Civ Pay Rates	0	0	43
Congressional Rescissions	0	-285	0
Congressional Adds:	0	0	0
Phased Array Radar	0	10,000	0
Pulse Detonation Engine	0	4,000	0
FY 2001 President's Budget:	37,624	51,331	37,966

(U) CHANGE SUMMARY EXPLANATION:

(U) Schedule: Not applicable.

(U) Technical: Not applicable.

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Budget Item Justification  
(Exhibit R-2, page 17 of 18)

# UNCLASSIFIED

# UNCLASSIFIED

FY 2001 RDT&E,N BUDGET ITEM JUSTIFICATION SHEET

DATE: February 2000

BUDGET ACTIVITY: 2

PROGRAM ELEMENT: 0602111N

PROGRAM ELEMENT TITLE: Air and Surface Launched Weapons Technology

C. (U) OTHER PROGRAM FUNDING SUMMARY: Not Applicable

(U) RELATED RDT&E: This P.E. adheres to Defense S&T Reliance agreements with oversight provided by the JDL.

- (U) PE 0601153N (Defense Research Sciences)
- (U) PE 0602203F (Aerospace Propulsion)
- (U) PE 0602232N (Communications, Command and Control, Intelligence, Surveillance & Reconnaissance)
- (U) PE 0602234N (Materials, Electronics and Computer Technology)
- (U) PE 0602302F (Rocket Propulsion and Astronautics Technology)
- (U) PE 0602303A (Missile Technology)
- (U) PE 0602601F (Advanced Weapons)
- (U) PE 0602602F (Conventional Munitions)
- (U) PE 0602618A (Ballistics Technology)
- (U) PE 0602624A (Weapons and Munitions Technology)
- (U) PE 0603004A (Weapons and Munitions Advanced Technology)
- (U) PE 0603609N (Conventional Munitions)
- (U) PE 0603216F (Aerospace Propulsion and Power Technology)
- (U) PE 0603640M (Marine Corps Advanced Technology Demonstration)
- (U) PE 0603790D (NATO Research and Development)
- (U) This is in accordance with the ongoing Reliance joint planning processes.

(U) SCHEDULE PROFILE: Not applicable.

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Budget Item Justification  
(Exhibit R-2, page 18 of 18)

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